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EDITORIAL.

ETIOLOGY OF HOG CHOLERA.—Dr. F. S. Billings makes his report to the Regents of the University of Nebraska—his review of work done previously—his acknowledgment of the researches of Dr. Detmers—investigations of Dr. Klein, Prof. Law and Dr. Salmon—the germ of hog cholera is not a micrococcus, nor is it a bacillus—it is a bacterium—its characters—the *micro-organism* is *entirely mobile* —other characters—conclusions of the report. REGULATION OF VETERINARY PRACTICE.—The law in New York State—*benefits* derived by the *pretended* legislation—New York veterinarians ought to have something better—no law would be better than the one now in existence—by it any one can register—if he cannot, he does not need to mind it, as there are many other ways to obtain registration—how long will this last—requirements to obtain a good law—these are precious jewels. SANITARY REPORTS—they are to be found in the State Veterinarians' Reports—they generally complain of the prevalence of several contagious diseases —why are they not published here as in Europe?—our call for the same ignored, or at least, neglected by American veterinarians. HORSE BREEDING RECOLLECTIONS. —an excellent little book by Count Lehndorff. NOTICE—*Retardataires* to the REVIEW—a last call to them—card sent to inquire as to renewal of subscription.

ETIOLOGY OF HOG CHOLERA.—In January last, Dr. Billings submitted to the regents of the University of Nebraska his report in relation to the labor performed in the laboratory of the State University in the experimental study of contagious and infectious diseases, and principally as involving the Etiological Moment in Swine Plague. And on account of the importance of the subjects, when such various opinions prevail touching the true nature of the disease in question, and considering the existing rivalry amongst biological investigators of hog cholera, we are sure we do not err in renewing the topic and appropriating a liberal share of our space to the discussion, even though it involves

the repetition of portions of the long and thoroughly scientific paper referred to. We hope to confine our quotations, however, to points of special interest to our readers and ourselves, and, particularly, as the author has addressed to ourselves a reply to a letter, heretofore published, from a prominent and able investigator and laborer in the same scientific field—Dr. Salmon.

As the length of Dr. Billings' paper renders its publication in its entirety in a single number of the REVIEW impracticable, and necessitates its appearance in separate parts, a recapitulation of its contents in advance will not be out of place.

The first part of the report is devoted to a statement of the results accomplished and reported previous to his own administration of the office, and includes those of Dr. Klein in 1876, and of Drs. Law, Detmers and Salmon subsequently. His review of the labors of Dr. Detmers is especially complimentary, and his favorable impressions are conveyed in his usual emphatic way of expressing his views. Here is what he says:

"I shall show that every right of priority for the original discovery of the only and true germ of American swine plague belongs to Dr. Detmers, and should the disease-producing germ prove eventually to be identical (as I am now inclined to believe against my former opinions) with the germ discovered by Loeffler and Schutz in connection with the German swine plague, although these claims do not interfere with my own as an independent and secondary discoverer of the same micro-organism. My work in this regard not only confirms that of Dr. Detmers in every essential, but I hope goes to correct some of his misconceptions, and will, I know, place this question of the etiology of American swine plague upon an impregnable scientific foundation. I also desire to testify to the extreme value of Dr. Detmers' field observations which give much evidence as to the nature of this porcine pest which it would take a long time to collect in the same practical form."

Following this, a large portion of the report is appropriated to an examination of the methods of these investigators in conducting their experiments, and while the various errors attributed to them are described and explained, due credit is awarded to well performed and successful work.

Referring especially to Dr. Detmers, his failure is attributed to want of proper instruments, a lack of coloring or staining ability, and deficiencies in means of investigations rather than to actual error in his interpretations of facts.

Reviewing the writings of Klein, who considered the germ of hog cholera, as Professor Law also did, a micrococcus, and also the conclusions of Detmers, who at one time called it a bacillus (bacillus suis) and again a micrococcus, Dr. Billings, after a few remarks on the morphological and histological phenomena of micro-organisms, proceeds to the observations which he has personally made, and says:

"The micro-organism of the true American swine plague is, then, a bacterium in its mature form. It is not a micrococcus.

"It is oval, being at least twice as long as wide when fully developed; its length as a mature individual being about one-half the diameter of the red blood cell of a hog when examined in freshly drawn blood under the microscope and care is taken that no atmospheric or chemical influences interfere with the morphology of the blood cell.

"It colors best in methylen-blue and methyl-violet; next best in gentian-violet and methylen-green; also very well in other violets, especially in a variety known as Hoff's violet, but not as well as many other organisms in fuchsin. As has been pointed out by Loeffler and others in Germany, the coloring capacity of many of these dyes is increased by adding to saturated solutions of the same in the coloring glass an equal quantity of a solution of caustic potash 1-10,000 aqua."

This bacterium is difficult to discover. The manipulations attending the process of coloring are delicate, but still its histological phenomena may be readily observed. Its method of proliferation is characteristic.

"*First let me say that this micro-organism is most actively mobile in fluid cultivations*, and that every one of the (to be described) biological phenomena can be seen, and are better seen, in a fluid culture than any other way."

The *true bacterial* nature of the disease being thus well established, Dr. B. takes up the subject in the post mortem lesions, and undertakes to solve the question often put, as to whether the American swine disease is analogous to that of Germany, or if hog cholera is similar to the schweineseuche. With a cursory review of the writings of Klein, Roloff, Schutz and Hueppe, the author presents his conclusions as follows:

"1. That the American swine plague is, first and most important of all, an extra organismal infectious septicæmia.

"Characterized:

"(a) By a peculiar swollen hæmorrhagic condition of the lymph-gland.

"(b) By pneumonia of a peculiar character.

"This is all the American swine plague consists of; other lesions accompany it, but are not essential to it.

"2. That the only and genuine American swine plague is caused by, apparently, the same germ as that discovered by Schutz in the German disease, and, if the natural characteristics are the same, that the diseases are identical. * * * * * * * * * * * *

"3. Swine plague proper is a strictly infectious disease, and not a contagious disease in any sense of the term.

"4. That the so-called 'characteristic' ulcerative and neoplastic conditions, so frequently found in the large intestine in swine plague, are not necessary complications in that disease, and, hence, are not pathognomonic to it. * * * *

"5. That death can be induced in healthy swine by inoculating them with an extra quantity of a very virulent virus, without there being an essential lesion present other than those in the lmyph-glands, and more or less ecchymotic hæmorrhage. * * * * *

"6. That those cases of swine plague which are characterized by an intense cholerine discharge are more frequently free from the so-called 'characteristic' ulcerative lesions in the large intestines than complicated by them.

"7. That the cases characterized by the so-called 'characteristic' intestinal lesions are more often accompanied by constipation, until the latest stages, than by diarrhœa.

"8. That the choleroid discharges are, in reality, those generally accompanying the last stages of septicæmia, and, hence, are not dependent upon ulcerative lesions in the intestines.

"9. That the term 'hog cholera' is a misleading misnomer, and that the disease is really a septicæmia, with the lesions in the lymph-glands and lungs as its peculiar characteristic, but also accompanied by the usual acute parenchymatous process in the chief organs in the body—liver, spleen and kidneys. Notwithstanding the fact that Law and some other observers report no lesions in the kidneys, every competent observer will find these organs the seat of acute parenchymatous disturbances in every case of natural infection; the cortex being opaque, anæmic, of a yellowish-gray color.

A few words touching the value of the pulmonary or intestinal lesions, as found by American, English and German writers, and a reference to the possibility of its transmissibility to cattle, completes this valuable addition to the literature on hog cholera.

Regulation of Veterinary Practice.—The passage of an act *pretending* to regulate the practice of veterinary medicine in the State of New York last year, having induced veterinarians in various other sections of the country to undertake the introduction of similar State legislation, we have thought that a few remarks touching the *benefits* (?) enjoyed under its operation by their New York fraternity might be pertinent and profitable.

Such objections to the new law as experience may have suggested since there has been opportunity for observing its working may also possess a certain interest and value, as tending to modify any enthusiastic anticipations which may have found their way into the minds of persons of a sanguine disposition in respect to the same matter, and who may be impatiently waiting the movements of their dilatory representatives in their several halls of legislation in other States.

It is not our intention to indulge in any extended remarks touching the New York law. We at first looked upon the act with favor and anticipated good results from its operation. Since then we think we have seen good reasons for characterizing the measure as the worst misfortune that ever befell the veterinary profession, and that so long as the veterinarians of New York are content to submit themselves to the disgrace now fastened upon them, they can claim no sympathy or commiseration on account of the low standing of the profession of their choice. Their bill was subjected to a shameful mutilation; the act, when passed, was condemned and thrown aside by mandamus from the courts, and a new act destroying the first is about to be passed, under which ignoramuses of all shades are to be authorized to buy certificates of proficiency, with which they will be entitled to register. What more may be necessary to bring the veterinarians of the "Empire State"—the birthplace of veterinary science in America—to a keen realization of the disgrace and shame of the deplorable attitude they are at length compelled to maintain? But a judge's mandamus or a retail certificate, bought in the market, are not at all necessary for an aspirant to veterinary profit and honor. Every man that has ever handled a four-legged animal is allowed to register. It may be the man who has castrated a few colts, or it may be the man mentioned in the letter which we publish from one of our correspondents, who asks for virus for the inoculation of cows against tuberculosis—*they all get recognition.*

This is the practical result of the law passed in New York, and from the provisions of which we hope our colleagues in other States will successfully labor to escape. No law at all is

better than bad legislation. Matters *may* go right under anarchy—they *must* go wrong under a bad law. Veterinarians ought now to be strong enough to obtain a proper recognition and regulation of their profession. If they are not, it would be better without any. But if they must have a law, let them not venture to press their demand for it until they are *unanimously earnest in their action; unanimously* HONEST *and* WORTHY *of the distinction they seek; devoted to their profession and jealous of the honor it confers and merits.*

SANITARY REPORTS.—The reports of the official veterinarians, acting in various capacities, in several of the States, have reached us, and they embody much information of value and interest on the subject of the contagious diseases of the domestic animals of the United States. The fear of the extension of contagious pleuro-pneumonia and the preventive measures recommended against it, occupy an important place in the reports of Drs. Holcombe and Hopkins, while the extensive existence of tuberculosis, glanders, hog cholera and anthrax, in its various forms, are mentioned in all, giving a general idea of the losses annually sustained from the ravages of disease amongst this living property so largely constituting the wealth of our people. In Europe, sanitary reports are published by authority, and find their way through the veterinary papers to an interested public. Some time ago we suggested the propriety of the adoption of this custom in this country. Our case, however, failed to meet with so favorable a reception as we anticipated, and now, when information may be required on these subjects, it must be hunted for in the Reports of the State Veterinarians on file with the States employing them. It will scarcely be contended that this is the best way.

"HORSE BREEDING RECOLLECTIONS," by Count Lehndorff, is a very handsomely printed book of sixty-four pages, received by us from Messrs. Porter & Coates, of Philadelphia. The work is illustrated by a number of very fine engraved portraits of rare horses. The Count is well known in thorough horse-breeding circles, and his observations are of much value to all, and especially to persons interested in particular breeds. The question of

in-breeding and out-crossing is fully considered, and though the conclusions of the author are adverse to close in-breeding, much valuable information may be obtained on that subject from the pages of this handsome little book.

NOTICE.—It is with regret, but it is upon compulsion that we do it, that we once more call attention to the fact that *many, very many*, of our subscribers have failed to remit their dues. Some are delinquents of one, some of two, a few of three, and some of even four years' standing. Though it was never our expectation to find in the REVIEW a source of wealth to its proprietor, it was never his calculation to suffer its publication to involve him in debt. This may be considered as a last reminder to our non-paying readers of their indebtedness. Their dues must be paid, or their names will disappear from our mail-book. The postal that we have sent lately was to enable us to correct our list of subscribers and do away with the irregular delivery as much as possible.

ORIGINAL ARTICLES.

THE ETIOLOGICAL MOMENT IN AMERICAN SWINE PLAGUE.

REPORT OF THE WORK DONE IN THE LABORATORY OF THE STATE UNIVERSITY OF NEBRASKA FOR THE EXPERIMENTAL STUDY OF CONTAGIOUS AND INFECTIOUS ANIMAL DISEASES.

To the Hon. C. H. Gere, President of the Board of Regents, and Prof. C. E. Bessey, Dean of the Industrial College:

GENTLEMEN—The demands of the public seem to require some information upon the work which my position in the University has called upon me to do since my appointment. In accordance therewith I have decided to offer to your honorable consideration a series of papers detailing said work at such times as its stage of completion warrants. Trusting the accompanying report will justify the honorable responsibilities you have conferred upon me, I remain, your obedient servant,

FRANK S. BILLINGS, Director.

Lincoln, Neb., Jan. 2, 1887.

THE ETIOLOGICAL MOMENT IN AMERICAN SWINE PLAGUE.

The time seems to have come when I should begin to make some personal announcements of the results of my researches upon this porcine malady.

In the following paper I intend to confine myself almost entirely to its etiology.

In an article which I published in Nebraska papers some time since, the following statement was made which requires some correction. I then said:

"While Drs. Law and Detmers have made some investigations into the cause and nature of American swine plague in years past, they have but little practical value, and do not require consideration at this time, and it is especially to those of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry at Washington, that I desire to call attention at present." * * *

In explanation of my assertion with regard to the work of Messrs. Law and Detmers and in justice to myself, I must first say that my attention at that time had only been given to the characteristics of the cause of swine plague, and that in looking up that subject I found that Dr. Law had certainly not described any micro-organism such as I had found and proved to be the cause of swine plague, beyond all manner of question. With regard to Dr. Detmer's claims, I was misled by his remarks in the report of the Department of Agriculture of 1878, in which he names the object seen by him "bacillus suis," and certainly describes a rod-organism, and as I did not then see any change of name in subsequent reports, in any of the headings, and did not carefully look over every word of the text, I assumed that Dr. Detmers was still describing the same object, particularly as I saw no allusion to anything else in Dr. Salmon's reports, which I did study word for word and sentence for sentence. An accident led me to the study of Dr. Salmon's work, which was his attack upon that of the State Veterinarian of Nebraska, which, while I knew it to be incorrect, still I did not care to let go actually unchallenged. I then studied Dr. Salmon's work with the result of at once discovering many inconsistencies in it, and fully as much untrustworthiness as in that of the State Veterinarian of

Nebraska. This has all been shown elsewhere. Since then my own work has arrived at such a degree of completion that the mass of clinical and experimental notes that have accumulated demanded that they be at once arranged in some systematic order, in order to prepare for future work in the spring.

This necessitated my making a most exact study of everything that had been contributed to the etiology of swine plague in this country and in Europe, with the exception of the work of Dr. Salmon.

My surprise can well be imagined when on doing this with regard to the work of Dr. Detmers, I found that he had (in the report of the Department of Agriculture, 1880–'81), described a very different organism to that mentioned in the report of 1878, but had not given it any distinguishing name (which, had it been done, would not have escaped my attention), and that from a mass of somewhat contradictory statements, it was possible to pick out evidence showing conclusively that he had had at times the true etiological organism of American swine plague under observation. * * * * * * *

I shall show that every right of priority for the original discovery of the only and true germ of American swine plague belongs to Dr. Detmers, and should the disease-producing germ prove, eventually, to be identical (as I am now inclined to believe against my former opinions) with the germ discovered by Loeffler and Schutz in connection with the German swine plague, although these claims do not interfere with my own as an independent and secondary discoverer of the same micro-organism. My work in this regard not only confirms that of Dr. Detmers in every essential, but, I hope, goes to correct some of his misconceptions, and will, I know, place this question of the etiology of American swine plague upon an impregnable scientific foundation. I also desire to testify to the extreme value of Dr. Detmers' field observations, which give much evidence as to the nature of this porcine pest which it would take a long time to collect in the same practical form.

Dr. Detmers, and especially Dr. Law, have also given much valuable evidence of the possible prevention of this disease by a

vaccine, and I must express my surprise that, with the unusnal advantages the latter has enjoyed for such experimentation, that Dr. Law has not long since pushed this work to its definite conclusion. I will simply say that we have confirmed these conclusions in Nebraska, as will be shown when I find time to write a paper upon this part of the subject, in which I shall give full credit to the work of Messrs. Law and Detmers. We will now turn our attention to the point in question—*the etiological moment in American swine plague.*

The first investigations upon this important question were made in England by Dr. Klein in 1876, but resulted in nothing of value, as has been shown by Dr. Salmon and alluded to in one of my previous papers. In this regard the following may not prove uninteresting:

My assistant, Dr. Thomas Bowhill, M.R.C.V.S., happened to have in his possession some very delicate sections of tissues—lung and kidneys—of swine plague which he brought from England. I requested him to dismount them very carefully and to remove all the balsam out of them. I was particularly desirous he should do this, as it was especially appropriate that an Englishman (or rather a Scotchman) should be the first to discover the true germ of swine plague in the tissues of English hogs, if possible. Dr. Bowhill (who has become an adept at staining, and does all my work of that nature), successfully demonstrated the presence of the same micro-organism in the tissues of his English hogs that we had invariably found in those we were studying here.

The first American investigations were made by Drs. Law and Detmers and published successfully in the reports of the United States Department of Agriculture beginning with the year 1878 and continuing in 1880-81, when Dr. Salmon enters upon the arena, though he had done some work previously.

Dr. Law's conclusion with regard to the etiological micro-organism of the American swine plague have not been confirmed by later investigations, but are as follows:

"This affection is characterized, perhaps (!) most important of all by the presence of colonies of minute globular micrococci in

the various seats of morbid change," p. 378, report 1878. In support of the hypothetical etiological connection of these "micrococci," which, from the language used, I am led to think Dr. Law looked upon as the cause of swine plague, he quotes Dr. Klein (Eng.) as follows:

"In 1877 he (Klein) cultivated the micrococcus for seven successive generations * * * and finally inoculated the product of the fifth and seventh generations successfully on two pigs, which seems to establish that these microphytes are the ultimate cause of this disease." Ibid, p. 378.

I regret to have to call attention to the direct contradiction of the above statement by Dr. Law himself, only three pages further on in the same report, where he says:

"From the cultivations of the fifth and seventh days, respectively, a drop was taken and two pigs were successfully inoculated."

"In the cultivations of each day were found myriads of bacilli, but no other organization (it should be organism—B.) and thns Klein was the first to show that the bacillus is the probable (!) cause of this disease." Ibid, p. 1881.

In the report of 1880-'81 Law says: "By a parity of reasoning it is probable (!) that the swine plague, which is presumed (!) to be caused, like anthrax, by bacteridean infection, etc."

It will thus be seen that Dr. Law has added nothing to the question, and hence we can leave him.

In order to place Dr. Detmers' position fairly before the public, as well as my own, it will be best to first notice his work in the report of 1880-'81, where he corrects his previous assertions and admits that he was mistaken with regard to the object which he styled "bacillus suis" as follows:

It may be casually remarked that the State veterinarian of Nebraska has lately shown his entire ignorance of this subject in the official report of the State veterinarian and sanitary live stock commission of Nebraska, December 1, 1886, where he says: "It is necessary to mention that swine plague is produced and spread by a germ called the bacillus suis."

Detmers says: "As to a proper generic name for the swine

plague schizophytæ I am at a loss. * * * They are not bacteria—by which he means rods—because the single cells are round." (Of this even he does not feel certain, for he immediately says): "They can hardly be considered micrococci, because in their developed form they are bispherical," p. 185. On page 186 of the same report, Detmers gives a description of this object, as sent by him, which should remove every doubt that the right of priority of discovery belongs to him, and that whatever I may have done to add to this knowledge is due to the extreme educational advantages that I have enjoyed in the latest methods of bacteriological investigations under the best masters in Europe.

Detmers further says: "The swine plague schizophytæ present themselves in different shape and form. The simplest form, it seems, is that of the micrococcus, a small round globule, which strongly refracts the light. *The second form is bispherical*, (This is his great error, as this is the first or mature form of the organism—B) the globular cell, micrococcus, has duplicated itself. The globular or spherical cell, or micrococcus grows and becomes somewhat oval in shape, but keeps on growing, while the indentation becomes deeper, still its length is about twice its width, and its shape bispherical. For some time, however, the bilateral indentation does not effect a complete separation; a connection between the two spherical cells remains sometimes only for a short time, sometimes longer. The bilateral indentation becomes deeper, while at the same time the single cells commence to grow and assume a somewhat oval shape, and in both another bilateral indentation becomes visible. Meanwhile the separation in the middle becomes perfect, and soon one bispherical cell has developed into two bispherical cells, or micrococci, which are yet slightly connected; at any rate they remain together, although the separation appears to be perfect, as each cell presents its own outline." Ibid. p. 187.

My attention was called to a later publication upon this subject by Dr. Detmers, in the *American Naturalist*, vol. 16, by Dr. J. M. Heard, V.S., of New York city, and I am indebted to Prof. C. E. Bessey, Dean of the Industrial College of the University, for the use of the volume in question.

Detmers considered it, in this paper, to be a "micrococcus" and mistook this, the vegetative, for the mature form, and the mature form for vegetative.

Here he says:

"The swine plague schizophytæ present themselves in three, and probably four, and even five different forms. As to three different forms I am certain, but as to the fourth and possibly the fifth I am not positive."

[Then comes the first error in interpretation which led to all subsequent ones; they are errors of interpretation rather than observation].

Detmers continues:

"The form to begin with is that of a very minute spherical body—a micrococcus. It is invariably present in the blood and blood serum in all morbid products and exudations, and in such morbid tissues as can be conveniently examined with high power objectives, when fresh. It probably is not necessary to state that the micrococci of swine plague, being spherical, do present any characteristic difference from other micrococci, if the latter happen to be about the same size as the former."

"Still, differences can be observed if the micrococci are kept under the microscope for some time (a few hours) at a suitable temperature. The swine plague micrococci soon form zooglea masses, or aggregate in clusters, and become imbedded in a comparatively viscous substance. While thus imbedded they soon commence to duplicate by growing in two opposite directions, and at the same time become contracted in the middle. This contraction gradually becomes plainer and plainer, and increases in the same degree in which the micrococcus is growing in length, till finally the latter presents the appearance of two closely connected spherical bodies without any visible partition and somewhat resembling the shape of a figure 8."

"At this stage the now bispherical micrococcus is about twice as long as its transverse diameter! ! !"

"In the interior of each spherical body a somewhat darker substance, or a kind of nucleus can be observed! ! !"

"This duplication, or process of division, which occurs in a

large number of micrococci at the same time, it seems, finally breaks the glia, or viscous mass, which apparently holds the micrococcus clusters together; the micrococci, many, or perhaps most of them, now bispherical (the real mature germ of swine plague—B) and some get single, become free and make their exit." —pp. 200, 201.

It will be readily seen by reading my own description of this germ, which will soon follow, that nothing but want of coloring the bacteria prevented Dr. Detmers from describing this organism correctly in 1880. His "bilaterial indentation" is undoubtedly the uncoloring, or transparent substance of the object described by me. There is nothing of the figure 8 appearance in the mature organism, the widest part of its body being the middle and not constricted as the figure 8 is, or as a dipplo (or double) coccus appears to be. There is, therefore, no indentation in the mature organism; but, before the separation of the two colored, or refracting ends, which Detmers terms micrococci, but for which I prefer the word sporules, this non-coloring, transparent substance becomes more extended, thinner, really presenting the appearance (in uncolored specimen especially) of an "indentation" between the two darker refracting ends of the object, until they each become isolated, round objects—micrococci—but almost instantly assume an oval form. These objects begin to swell at once, and then, by some unknown process, but distinctly a form of fission, they become separated into two coccus-like objects; by the secretion of the non-refracting and non-coloring material, which forms a band of connection between the two round, coccus-like ends, the whole making an oval organism twice as long as wide.

While there are many misconceptions in Dr. Detmers' descriptions of the biological appearances of the micro-organism of swine plague, still there is no doubt that he frequently had it under observation in 1880, though I very much doubt if he had it in a pure culture (unless by accident) from the descriptions which he, himself, gives of his methods of making his cultivations, such as:

"I charged an ounce of fresh milk, just drawn from the cow, with a mere speck of the proliferous growth of the stomach of Mr. L.'s pig. The milk thus charged and contained, in a perfectly

clean, two-ounce vial, closed by a tightly fitting glass stopper, was kept at a constant temperature of from 90 to 100° F."—p. 378, Report of the Department of Agriculture, 1879.

Anyone the least acquainted with the methods of obtaining pure cultivations of micro-organism will see that it would be next to impossible to obtain the same in any such way. Such a medium as "milk just drawn from the cow" invariably contains a mixture of germ life. There is no mention made of the preparatory cleansing and disinfection of the teats of the cow or the hands of the milker even, and the same is true of the proper sterilization of the "perfectly clean two ounce vial."

The apparent crudeness of Dr. Detmers' methods of investigation must not be attributed to any want of knowledge on his part, for it was really magnificent, considering the state of our knowledge at the time he worked, and especially when we consider the condition of instruction at the German veterinary schools at the time he studied. My admiration for Dr. Detmers' scientific abilities is still more augmented when I consider the very poor laboratorial conveniences that he enjoyed.

In introducing some quotations of his work, which at first sight would appear to be with the purpose of detracting from its value, I desire to say that my real purpose is quite the contrary. These quotations have a two-fold value:

1. They show how great the quality of his work was.

2. They show how much we have improved in the methodic of bacteriological investigation, and are also instructive as showing how errors may be avoided in the future.

Oil-immersion lenses and the Abbe condensor had not been perfected at that time, hence Detmers did his work with water immersion lenses, and he tells us with the simplicity of an honest man that one day, "January 27, in the afternoon, he filtered some pulmonal exudation from a pig that had died of swine plague, through several pieces of paper, for the purpose of freeing it from the bacillus germs which it contained. The filtering was done on a small table in the corner of the room, and the apparatus was left standing on that table with the wet papers (4) in the funnel after the filtrate had been removed. In the evening the latter

was examined under the microscope on another table in the opposite part of the room, and as my two highest objectives are immersion lenses, I had to use water, and had a tumbler full of clean water (!) on my table just drawn from the well. When through with my work, instead of pouring the water out, I placed the tumbler on another table, about four feet distant from the filtering apparatus.

Next morning I went to Chicago to return on the 30th. In Chicago I procured a new immersion lens, and about the first thing I did after my return was to try that lens.

Finding everything undisturbed in my room, and the tumbler with water exactly where I placed it, and not intending to examine but a test object, I did not go for fresh water, but used a drop of the water in the tumbler.

While adjusting the focus I discovered that the water, which I knew had been absolutely free from organic matter (! ! !) was swarming with bacilli and bacillus germs of the same kind as those in the pulmonal effusion," p. 383, Ibid, 1879.

Detmers then assumes that, as the above mentioned filter paper had dried, and during his three days' absence, that the germs in or on it had got into the air of his work-room and fallen into the tumbler of water, which had been drawn from the well, and which to a dead certainty contained micro-organism when it was drawn; it was then placed in a tumbler originally used for the purpose, which also had the same organisms on its sides to an equal certainty and left exposed to the air of his ordinary work-room for three days, which was still more certainly contaminated with any desired mixture of such organisms.

Again he says:

"On September 23 Prof. B. charged two drachms of fresh cow milk with a mere speck, smaller than a pin's head, of a decaying morbid growth, or ulcerous tumor, of the cœcum of pig No. 5, and kept the vial closed at a temperature of 92° F.

On the evening of September 20 the milk was examined under the microscope, and found to contain numerous bacillus suis and bacillus germs, the same as found in the blood serum or exudations of diseased lungs, and in the decaying substance of the intestinal growths."

Another example will suffice:

"On June 10 I took two perfectly clean (! !) four-ounce vials and put in each three ounces of clean well water, in which no bacteria, or any living thing could be found. In one vial marked No. 1, I put half a drop of the fresh pulmonal exudation of a hog that had died of swine plague," p. 385, report 1879.

The more one reflects upon such a methodic the more must be his astonishment that Dr. Detmers should arrive at such comparatively accurate ideas of the biological conditions presented by the bacterium of the American swine plague. As has been said, a pure cultivation of this organism, under such organisms, can have only been an accidental occurrence.

Even the material which I have quoted from Dr. Detmers' publications has been very carefully selected from among many vague assertions, and in some cases absolute contradictions, as may be seen from the following passage:

"The spherical, or single micrococci, undergo their first change, and develop into bispherical bodies, till the glia breaks open, when a great many bispherical schizophytæ, and also some of the spherical bodies, become free. The former (the bispherical bodies), thus freed, very soon commence to multiply by fission, but this process results in the production of bispherical, not spherical cells, or micrococci, the latter must have another origin," p. 188, report 1880.

No further evidence is necessary to show that, while Detmers at many times describes phenomena connected with the germ of swine plague, at the same time he had no distinct idea of the real vegetative phenomena of the object he was describing.

In the above quotation he contradicts himself in the most startling manner.

First he tells us that "*the spherical cells, or single micrococci, undergo their first change and develop into bispherical bodies,*" which is absolutely correct, and then he says that they do no such thing, by saying, that "*these spherical cells or micrococci must have some other origin.*"

He missed the first stage of development, that from the mature germ, or bispherical bodies, into micrococci, and describes

the second, or development of micrococci into the mature germ.

In his illustration of this organism, p. 200, *American Naturalist*, vol. 16, he illustrates the mature form more than he does the vegetative state, and gives a very fair picture, though not exact, of the organism.

(*To be continued.*)

LECTURE ON AGNOSTICISM.

By Prof. Alex. W. Stein, M.D.

This is the last lecture of this session. You will now go home and quietly review in your minds the vast field of learning which you have gone over in the several departments which constitute your curriculum, and you will ask yourselves, "What do I know?" Be sure of knowing that you do not know.

All that lies in matter and force we see "through a glass darkly." The make-up or composition of the most familiar things we know only imperfectly. Matter, of whatever kind, whether inorganic or organic, living or lifeless, we can examine only in part, for we have never been able, with the highest powers of the microscope, to make visible the atoms or smallest particles of which it is composed. We are agnostic of the relations that particles of matter hold to each other, and the forces which govern them. Separate sand into the smallest particles you can, and you will never reach the superlative degree of smallness of a molecule or silicon oxide; and when we say that each molecule consists of atoms of silicon and oxygen, we have certain reasons for the faith that is in us, but no ocular proof of the same.

In order to realize the exceedingly small size of the individual molecules, Sir William Thompson imagines a single drop of water to be magnified until it becomes as large as the earth, having a diameter of 8,000 miles, and all the molecules to be magnified in the same proportion, and then concludes that a single molecule

will appear, under these circumstances, as somewhat smaller than a cricket-ball.

Take a crystal of calc-spar; it is capable, as you know, of being decomposed into carbonic acid and quick-lime, and the inference would be that if you pass carbonic acid over quick-lime you will form calc-spar; but no; you will form lime carbonate, simply, but not calc-spar. Or take oxygen and hydrogen, pass an electric spark through them, and they disappear and a quantity of water appears in their place. There is no similarity between the properties of the water and those of the oxygen and hydrogen which have given rise to it. At 32° and below it, oxygen and hydrogen are elastic gaseous bodies, whose particles tend to rush away from one another with great force; water at the same temperature is a solid whose particles tend to cohere into definite geometrical shapes, and sometimes build up frosty imitations of the most complex forms of vegetable foliage. You say these are the properties of water, but that is all you know about it.

Again, matter may change its form, but the quantity of matter remains the same. Man can neither create nor destroy a single particle. An element is an *immortal body*. Water may disappear in vapor; wood and coal are consumed, but in these not a particle of matter is annihilated; the apparent destruction is merely a change of form. In due time the vapor becomes condensed and turns into water, and in the burning carbon the atoms in a gaseous form are brought again into a visible condition in the leaves of plants. And what is true of matter is equally true of force. Motion, heat, light and electricity are mutually convertible without loss. The conversion of motion into heat was known to our aboriginal brethren, who built their fires by rubbing two pieces of wood one against the other. The movement of the piston of a steam engine expresses so much expansive power in the steam, and this power is the expression and correlate of the heat produced by the combustion of so much fuel. Every pound of water heated one degree will raise one pound weight 772 feet, and the fall of one pound weight 772 feet will make one pound of water one degree warmer. The disappearance and in-

destructibility of force is well illustrated in the example of latent heat. If a pound of water at 32° be mixed with a pound at 174°, the mixture will have the mean temperature—that is, 103°; but if a pound of ice at 32° be mixed with a pound of water at 174°, the mixture still remains at 32°, and the reason for this is that the solid (ice) in passing into a liquid (water) requires 142° of heat. This heat is inappreciable by the thermometer. The heat energy is spent in overcoming the force of cohesion. But it is not lost, for when the liquid (water) again assumes the solid (ice) state, it is again evolved as appreciable heat. A wise provision that time is necessary for the melting of snow and ice, on the one hand, and the freezing of water on the other. Coal and wood represent the amount of force in the shape of the light and heat of the sun which was expended in their production, and when they are burnt give out again just that amount—a conversion of first visible energy into potential energy, and potential into visible energy,—a resurrection, as it were, of force buried for centuries beneath the ground.

So I might show the reciprocal relations of the physical forces by chemical action producing electricity, electricity producing heat, light and motion. Thus we know the physical forces by their effects; we know that all bodies, with a few exceptions, expand when the temperature is increased, and contrary when it is reduced. We know that there is an affinity exerted between minute particles of different kinds of matter, causing them to combine so as to form new bodies endowed with new properties. This we term electrical affinity, but there our knowledge ends. But you may say, the trouble is that the forces of cohesion and chemical affinity act through such inconceivably small intervals; but you are no better off if you take the force that acts at a great distance, viz., gravitation. You say the sun pulls the planets because it has 700 times more molecules than all the planets put together, and so it keeps them moving around it. Our earth has eighty times more molecules than our moon, and so it keeps the moon moving around it. But you cannot tell why an apple falls to the ground, except on the same unsatisfactory hypothesis.

I cite these more than familiar examples, and I am afraid you

will be tempted to say with Josh Billings, "A man had better not know so much than to know so many things that *ain't so*." But no; the only way we have of formulating our ideas is through physical laws. Take from us the faculty of philosophical reasoning, and all research and progress will stop. But I wish simply to show that spiritual agnosticism is quite in conformity with man's knowledge of material things. The material world is the shell through which we have to break to reach the kernel of *life*, *mind* and *soul*.

Let us now turn to living matter, and here we shall find a complexity of composition and of function which becomes more apparent the higher we ascend the scale of animal life. At the bottom of the sea is found a slimy, sticky substance, which, upon chemical analysis, yields carbon, oxygen, hydrogen, nitrogen and sulphur. It is so small that you place it under the microscope. It consists of an irregular spatter of semi-fluid matter, colorless, transparent, and structureless. This body, the monad, is the simplest organism with which we are acquainted; yet it is the perfect type of living matter, and although it does not display any structure, it performs the functions of the most highly organized animals, namely: motion, assimilation, sensation and procreation. This body, when completely at rest, assumes the shape of a simple sphere, and, as a rule, it is in incessant motion, throwing out delicate arms or processes; these, adhering to some portion of the glass slide, drag the body after it, and so it moves sluggishly from place to place. When a small diatom, another dweller of the sea, inclosed in a shell, comes in contact with it, it surrounds, absorbs and assimilates the nutritive portion, and rejects the empty shell. In a little while you will observe a multiplication or segmentation of the central mass, and each minute particle instantly begins a separate existence, and gradually reaches the size of the ancestral organism. If now you touch the surface with a point of a pin, or send a current of electricity through it, the threads are drawn in and the entire body contracts into the form of a spherical lump.

Now let us jump from the lowest of animal life to man. If we take a drop of blood and keep it at the temperature of the

body, there will be found, under a sufficiently high magnifying power, among the innumerable red blood corpuscles, a comparatively small number of colorless corpuscles, $\frac{1}{3500}$ of an inch in diameter, which will be seen to change their form, drawing in and thrusting out prolongations of their substance and creeping about over the slide. These amorboid movements, as they are called, are of special interest on account of the "wandering out" of these particles of protoplasm through the walls of the blood vessels, as you know they do in inflammation. But in addition to this, the absorption of small particles into their interior and the excretion of the same, is to be noted.

This living matter is to be found in all the structures of the body. As a matter of fact, the body in its earliest state is a mere multiple of protoplasmic units, which are differentiated sufficiently to inaugurate the first series of changes, and these inaugurate others in succession, until the animal is completed.

Thus throughout the vast domain of the animate world, from the monera to man, there is but one kind of actively living matter (which has been given the names bioplasm or protoplasm), and we, the highest of created beings, are but a compeer of the lowest. There is a unity of faculty and a unity of composition which pervades the whole living world, and the difference between the powers of the lowest plant or animal and those of the highest is one of degree, not of kind. Two masses of living matter, alike to the eye of sense, but not alike to the eye of reason, for one will form a dog and the other man, or from one minute germ you have the grand oak, from the other the lily. Then: "Consider the lily how it grows; and yet I say unto you that Solomon in all his glory was not arrayed as one of these."

Here, too, we see the correlation of organized beings to inorganic matter under the genial influence of solar heat and light. The plant lives upon inorganic materials, converting lifeless matter into living bioplasm, while animals live upon the plant. Thus, directly or indirectly, living organisms are linked to the globe they inhabit, and the grand Scriptural dictum, "Dust thou art, and unto dust thou shalt return," is not more philosophical than it is physiological. It expresses concisely the relations which

bind living to dead matter. In a like manner, dead or lifeless bioplasm may be converted into living. Thus, I may indulge in a fish dinner and transubstantiate dead fish into living man, and if I were to make myself accessible to them, the fish would return the compliment and demonstrate our common nature by turning my dead bioplasm into living fish.

As to the laws which govern life, scientists are divided into two classes—vitalists and physicists—or those that relegate the properties of life to a vital force independent of physical force, and those that assume that the physical forces are the only forces in the universe. It is, it seems to me, illogical to infer that the vital forces are independent of and altogether opposed to physical forces. A living organism builds itself up in accordance with natural laws, and avails itself equally of inorganic matter and physical force. Bioplasm appropriates and assimilates matter, but in doing this it does not necessarily interfere with capillarity, chemism, gravitation and osmoses.

On the other hand, it is too soon to put forth force and matter in living organisms in the same causal connection which has long been accepted for force and matter in inorganic bodies. But you will ask, with Huxley, "What justification is there for the assumption of the existence in the living matter of a something which has no correlate or representative in the not living matter? —what better philosophical status has 'vitality' in the case of bioplasm than 'aquosity' in the case of water?" To this I will put another question: What makes this matter do things while it is alive, which it cannot do when it is dead? Has the chemist or physicist ever created anything which manifests the powers of assimilation, growth, movement and reproduction? In unwrapping an Egyptian mummy, there was found a sprig of wheat which had lain with the body, it was said, three thousand years. This was planted to see if it had life, and lo! it sprouted and brought forth wheat—a resurrection of life buried for three thousand years. What a theme for our contemplation!

No; physical science has not revealed the true nature of life. All that we know is that life is an heirloom bequeathed from parent to offspring. In the language of Paul, "In Him we live and move and have our being."

Gentlemen, I would not be considered an image-breaker, who gives nothing in the place of what he destroys. It is so much easier to pull to pieces than to construct. I cannot oppose your judgment, if I would. When an argument is unreasonable, you set it aside; but if it appeals to your judgment, you are forced to accept it, whether it is acceptable or not. Prejudiced though we may be to be told that man is but a civilized monkey, we are bound to admit that the globe itself is a sublime history of evolution; and he who will read it as it is written, will be forced to the conclusion that mind existed before matter, and so the facts which I have laid before you to-day must rest.

But let us always remember that knowledge is finite. We see but the reflexion of things at best, not the things themselves. Knowledge is within our grasp; it deals with matters tangible, but faith is infinite, and leads us into the boundless realms of the imagination. What is imagination? You will not deny its existence, though you cannot give the correlate for it in physical force.

One thing we may take upon inference: that if neither matter nor force can die, it would be a great anomaly in creation if the principle of *conscious identity* were capable of utter annihilation. Then—

> "So live that when thy summons comes to join
> The innumerable caravan which moves
> To that mysterious realm where each shall take
> His chamber in the silent halls of death,
> Thou go not like the quarry slave at night,
> Scourged to his dungeon, but sustained and soothed
> By an unfaltering trust, approach thy grave
> Like one who wraps the drapery of his couch
> About him and lies down to pleasant dreams."

New Appointment.—Dr. C. J. Alloway, formerly of Montreal but now of Grand Forks, Dak., has been appointed Territorial Veterinarian under the law passed by the late Dakota Legislature. The appointment seems to meet with unanimous approval.

GLANDERS.

By Veterinarius.

A Contribution for the Prize offered by the U. S. Veterinary Medical Association for Papers published in the American Veterinary Review.

(*Continued from page* 16.)

Dr. Loeffler's next experiment was to develop cultures from the greatest number of glandered horses possible, and see if the same micro-organism would invariably develop. The first horse examined presented, besides other symptoms, an exquisite case of chronic glanders in the spleen and liver. Cultivations were made from the liver and spleen. Those from the liver did not yield many colonies, but what it did were very characteristic; the splenic cultivations remained sterile. Bacilli could not be demonstrated in the tissues by any method of colonizing. Experiments and examination of the organs of another horse gave more satisfactory results, the characteristic bacilli being easily found when subjected to the methyl blue process as already mentioned. Cultivations gave the previously described yellow vesicles. The third horse presented the phenomena of acute glanders in optima forma both in the septum nasi and lungs. In cultivations from the lung nodule in blood serum the development was so profuse that the surface appeared as if covered with a yellow transparent coating; the single vesicles could only be distinguished at the edges. The characteristic bacilli were easily demonstrated in sections of the ulcers and pulmonary noduli. A fourth horse, which was very old, presented chronic ulcerations with indurated edges in the septum nasi, the cartilages being necrotic underneath. Tough fibrous noduli, many of which were calcified, were found in the lungs; the liver was also the seat of large noduli, the centre of which had undergone puriform softening. In this case cultivations were made from nodules from the liver as well as the lung, in order to guard against contamination from without. In this case the yellow vesicles again developed on blood serum, but in small colonies, as in the first case of chronic glanders, a result that was anticipated from the age of the neoplasms.

It now became a matter of great importance to demonstrate the presence of the same bacilli in the organs of other animals that had been inoculated with material from glandered horses and acquired the disease beyond all doubts. Rabbits inoculated with fresh material in the ear and abdomen did not present the symptoms of general infection, an ulcerative process only developing at the locus inoculationis. The eventual demonstration of the bacilli in the peripheries of ulcerations, standing in direct relation with the external world, could not be of a pathogenic value, as an objection could be raised that they had gained access to the tissues from without. In guinea-pigs the conditions were quite different, as in them not only were local processes developed, but a thoroughly characteristic infection of the internal organs followed the inoculation. Illustrated by the following examples:

First case. A portion of an old glanderous nodule from a horse was introduced under the skin of a guinea-pig, and in fifty days the animal died. Autopsy: Long, fluctuating tumors on the left axilla; spleen studded with numerous greyish-yellow miliary noduli, as well as the liver, though the neoplasms in the latter were much smaller than in the spleen, and of a grey color. The left suprarenal capsule contained a yellow node, as did also the epididymis of the same side. One of the retroperitoneal glands was hypertrophied, as large as a cherry, and filled with a delicate, greenish-white puriform material. The nasal cavities were filled with a purulent mass, the mucosa being ulcerated in many places. Similar results do not follow the artificial inoculation of guinea-pigs with other infectious material or any natural disease to which they are subject, therefore the above disease cannot be considered as any other than glanders. In covering glass preparations from the nodules of this guinea-pig, as well as sections from the tissues treated with methyl-blue, the same fine bacilli were recognized as demonstrated by the cultivating methods.

Second case. A guinea-pig was inoculated in the posterior abdominal region with fine particles of a glanderous neoplasm from the lung of a diseased horse. The animal died in twenty-seven days. Autopsy: Ematiated rough coat; axillary and inguinal glands of the right side swollen and fluctuating; on section a

greenish-white fluid oozed out. The inguinal glands of the left side were also swollen and full of yellow centres. Spleen enlarged; liver in a similar condition; both filled with greenish noduli. Kidneys intact. Lungs contained greyish-red neoplasms. Testicles both hypertrophied, the inner and outer membranes being adherent. Left foot swollen, and on cutting through the skin a purulent material escaped. Left side of the septum nasi ulcerated and covered with crusts. The presence of bacilli in the numerous tissues left no doubt as to the nature of the disease.

The third case gave the same results.

These cases were selected from a great number of animals that were subjected to experimental inoculation, and show that guinea-pigs inoculated with glanders material develop a very characteristic disease, and that the same specific micro-organisms were produced as occur in equine glanders, as demonstrated by microscopic examination and cultivation experiments.

Dr. Loeffler's next experiment was to show that the bacilli thus derived and cultivated from glanders noduli and products were not accidental occurrences in the disease, but the actual etiological moment, and that the disease itself could also be generated by inoculations from pure cultivations of the micro-organisms. Eight days after a cultivation of glanders material had been sown upon blood serum, a small quantity was taken up upon a previously heated platinum wire and reinoculated upon fresh material. Eight days later another cultivation was again made in the same manner, and twelve days later another. It was assumed that none of the original organisms were present in the fourth generation. The cultures consisted of nothing but the previously considered fine bacilli. Thirty-six days from the time the first cultivation was sown some of the material from the last cultivation was mixed with a small quantity of sterilized blood serum and inoculated into the Schneiderian membrane and both shoulders of a horse apparently free from any symptoms of glanders. The syringe used for the experiment was sterilized by exposure to 160 deg. C. The animal's temperature began to rise within forty-eight hours, measuring 39.5 deg. C. in the rectum. One could feel a small elevation at the locus inoculationis. An ulcer

developed at this point in a few days and gradually increased in extent, and encroached upon the underlying tissues; the base of the ulceration presented a grey, lardaceous appearance, and secreted a greenish-yellow mass which stuck to the edges of the nasal opening. From the point of inoculation on the shoulders there issued at first a yellowish, then greenish-yellowish, viscid fluid which adhered to the hairs as it flowed over them; a lymphatic cord the size of one's finger extended from the nasal ulceration to the corresponding intermaxillary gland. Similar cords were present on the shoulders extending to the axillary glands. In two weeks the animal presented all the characteristic clinical phenomena of *acute* glanders. However, contrary to expectation, the animal gradually improved, and instead of secondary ulcerations developing in different parts of the body, the fever ceased, the ulcerations did not extend, and finally manifested a tendency to cicatrization; the hypertrophied lymph glands became smaller, so that at the end of four weeks doubts arose as to whether the above phenomena could be considered as belonging to glanders. Dr. Loeffler concluded to kill the horse, in order to observe the internal conditions. The autopsy caused considerable astonishment. Upon the septum nasi, as well as in the immediate tissues between the nose and pharynx, numerous whitish and radiating cicatrices were found; the lungs presented old fibrous and calcified nodes of varying dimensions, as well as fresh noduli of variable size, surrounded by red rings. At the root of the lung a large noda surrounded a bronchus, which, on section, had a yellow appearance, its surface being studded by a number of miliary greyish neoplasms, situated in a yellow gelatinous substance. A radiating cicatrix was present at the locus inoculationis in the septum nasi; the products at the same point on the shoulder were about the size of a hazel nut, and contained a yellow caseous material. The intermaxillary and axillary glands were somewhat larger than normal. All these conditions indicated that the animal was the subject of a glanderous infection for a long time prior to the above inoculation, and the time of this experiment did not show any suspicious indications of any such complications.

The above experiment being of no pathological value, owing

to the animal being already afflicted with glanders, a renewal of the experiment was necessary.

The subjects were a healthy horse, 20 years old, and one 2 years old. The old horse was inoculated with virus from a pure cultivation of the original material in the tenth extra organismal generation. The young horse was inoculated with a culture of the fifth generation, that was made from the testicle of a guinea-pig that died 24 days after being inoculated, and which had been inoculated with the fourth generation of the original material. In order that the inoculation of these horses should be as severe as possible, the material was introduced in considerable quantities in both shoulders, the breast, flank, and the back of the nose. Nothing was injected into the mucosa of the nose, in order to see if secondary eruptions would develop in the same.

In a few days, at the locus inoculationis, a diffuse œdematous tumefaction was to be seen. The animals ate poorly, were stiff in their movements, and had staring coats. In the course of eight days the tumefactions opened and secreted a cloudy greenish-yellow material. On the 12th day an ulcer appeared on the forehead of the younger horse, about the size of a quarter-dollar, penetrating to the bone, with irregular indurated edges. In both animals a nasal secretion appeared, which desiccated in thin, dry crusts upon the wings of the nostril, and, finally, development of ulcerations in the mucosa of the nasal cavities, which placed the glanderous nature of the induced disease beyond all question.

Both animals became daily more and more emaciated. The elder died first.

The following is the result of the autopsy: At all the points of inoculation, ulcerations the size of a quarter of a dollar and larger, were present; the same were covered with thick crusts of dessicated secretions and hairs; they secreted a yellowish-white material. The soft tissues beneath these ulcerations were degenerated, and almost in a fluid condition; the surrounding subcutis was infiltrated with a purulent material. The ulcerations in the neck were in connection with lymphatics that formed cords extending to the axillary lymph glands, which were as large as a hen's egg, their cut surface presenting numerous small yellow

centres. Swollen lymphatics were also present at the other seats of ulceration, and could be traced to the adjoining lymph-glands, which were swollen, and also presented yellowish-white centers. There were numerous ulcerations with swollen indurated edges in the mucosa of the nose, and at the base of the ulcerations numerous gray or yellow noduli were to be seen. The submaxillary glands contained nodules the size of a bean, full of yellowish centers. The mucosa of the anterior face of the epiglottis contained an ulcer about the size of a ten-cent piece, with jagged, indurated edges. Numerous noduli of various sizes were present in the lungs, the larger being formed by a confluence of smaller ones composed of grayish clouded centers, surrounded by a reddish circle of tissue. Noduli were also present in many muscles of the body, and also nodes filled with a yellowish-white or grayish material, which in some cases assumed a fluid character. The results in the older animal being so confirmatory, it was resolved to kill the younger one, which at this time was very much emaciated. The following is the result of the autopsy: Extensive ulcerations of the point of inoculation, yielding a profuse yellowish-white secretion; the ulcers on the back of the nose were about the size of a silver dollar, and extended to the underlying osseous tissue; a somewhat smaller ulcer was present over the frontal bone, its base being covered with a hæmorrhagic mass. Several small ulcers were also present on the skin of the near hind leg, and one on the sheath. The ulcers on the neck were connected with the axillary glands by lymphatics of great thickness, with nodular enlargements along their course. These noduli were partly within and partly external to the vessels, and contained a puriform fluid. The axillary glands were soft in consistence, and about the size of a hen's egg, and numerous grayish-yellow centers existed in their substance. The ulcerations on the walls of the thorax extended through the skin into the muscles, and swollen indurated lymphatics could be traced leading from them to the axillary glands. The ulcers in the flanks were flat, and the adjoining tissues much infiltrated. The right axillary gland was soft and about the size of a hen's egg, vascular and reddish in color. The left was not so much swollen. The subcutaneous

tissue of the sheath was of a gelatinous character, and the lymph glands in and around it were hypertrophied. Extensive cavities were observed in a number of muscles, filled with a clouded fluid of a yellowish-white color. The nasal mucosa were filled with numerous noduli and ulcerations, the former being gray or yellowish in color. The surrounding mucosa was hyperæmic and red; the edges of the turbinated bones were complicated with these productions; no ulcerations were present in the mucosa of the pharynx, larynx, trachea and bronchial tubes. The submaxillary glands were as large as a walnut and exceedingly indurated, but not attached, and on cutting them numerous yellowish-white neoplasms were observed. In the lungs six small noduli were found, surrounded by a somewhat dense parenchyma and hyperæmic tissues. The adjoining lymphatics were enlarged. Spleen hypertrophied, soft, and of a dark-brown color. The liver, kidneys, heart and muscles presented nothing abnormal beyond a slight cloudy swelling.

The clinical as well as the microscopical phenomena permitted of no doubt as to the nature of the induced disease. The characteristic bacilli were present in the tissues, and cultivations from both of the above animals.

To test the question further, a number of guinea-pigs were inoculated with fresh material as it was taken from the horses. One of them, inoculated with material from the old horse, died in 15 days. The autopsy and microscopic examination of the neoplastic products gave full evidence of the nature of the disease. Similar results followed in each of the animals inoculated.

These investigations led to the following results: That in the specific products of a typical case of glanders in the horse, and the neoplasmata produced in guinea-pigs inoculated with material from such a horse, a bacillus was found which can be demonstrated by traction, and especially by cultivation upon blood serum. Pure cultivations of many generations caused glanders in horses and guinea-pigs upon inoculation, which is sufficient proof that those bacilli are the etiological moment in glanders.

Shortly after the publication of the above experiments, Bonchard, Capitan and Charrin published results of similar studies.

The French investigators did obtain infecting cultures from glanders material, but were unsuccessful in obtaining pure cultures of the same.

Israel published the results of similar investigations. He succeeded in three cases in cultivating bacilli from the pulmonary noduli of glandered horses, and describes said bacilli as somewhat thicker than tubercle bacilli, but easily distinguished from the latter by the great dimensions of the spores. Israel induced a disease in rabbits with his cultivated bacteria, which Dieckerhoff declared to be glanders. It is singular that he succeeded in coloring his rods in tissues used in the ordinary manner.

Wassiliff demonstrated the presence of the bacilli described by Dr. Loeffler in the blood and postules of a man affected with glanders, by the methyl-blue method.

The most confirmatory evidence was given by Kitt, of Munich, and Weichselbaum.

One of the first and most essential tasks in the study of any pathogenic organism consists in discovering what species of animal is most open to infection, in either a natural or artificial manner; that is, possesses a sort of biological affinity for such microorganisms. It is necessary to find such animals among the smaller and cheaper varieties, which thus act as a sort of reagent for such organisms as was shown in the study of anthrax. The horse and ass are the animals which are open to infection with glanders, especially the latter. The high cost of these animals, and the difficulty of providing suitable locations for the study of the disease in them, the removal and care of such large cadavers, renders it necessary in experimentation only to resort to such animals in the most important and test cases, while for ordinary studies to have recourse to mice, rats, rabbits and guinea-pigs.

TRANSMISSION OF GLANDERS TO OTHER ANIMALS WITH PURE CULTIVATIONS OF THE BACILLI.

The number of animals of different species in which either natural or artificial glanders has been observed, induced or attempted, is by no means small; it includes the solipeds, ruminants, omnivora, carnivora and rodents, and experiments were

even attempted with fowl. Cattle possess a natural immunity from glanders infection. Gerlach repeatedly inoculated two calves and a one-year old steer with the nasal secretion from a glandered horse, but with no effect. Hertwig reports five experiments with similar results. In 1843, Wirth experimented with a buck goat, but as secondary inoculations were neglected, the case requires the necessary confirmation.

In 1861, Ercolani records the case of a goat kept in a stable in which five horses had become glandered in the course of fifteen months. The lesions were in the udder, a viscid nasal secretion, abscess on the swollen intermaxillary gland, and small noduli in the lungs.

In 1875, Karsten Horne reported a case similar to the above.

Hertwig reports the death of one out of three goats on the 18th day after inoculation with glanders material. The autopsies confirmed the clinical phenomena.

Bollinger reports positive results of the same nature.

Trasbot also mentions a case of the natural infection of a goat in a stable in which there were several glandered horses.

Judge Mason, of Lincoln, Nebraska, recently brought a very doubtful case to the happy conclusion of saving both parties in a horse sale case from an expensive lawsuit, by inoculating two sheep and two goats from the visible ulcerations in the nasal cavity of a glandered horse. Before the case was called, the four inoculated animals died, with unmistakable symptoms of glanders. I may state that the case did not come on, as the defendant settled.

Sheep are not so sensitive to infection as goats. Viborg reports his efforts in this direction as unsuccessful. Renault and Bouley were more successful, and produced glanders in two sheep inoculated by them. Gerlach produced glanders in a sheep fifteen days after inoculation.

Swine seem to possess a natural immunity from glanders, so far as can be determined from existing evidence. Numerous experiments have been recorded with animals belonging to the orders carnivoræ and rodentiæ, but the results were contradictory and unsatisfactory.

Dr. Loeffler experimented with pure cultivations of the bacilli.

He inoculated two rabbits on the inner part of the ear, and in five or six days observed an infiltration at the locus inoculationis which soon became ulcers with a grayish lardaceous base; the corresponding glands at the base of the ear became swollen, the suppuration gradually ceased in one of the rabbits, leaving only an œdematous condition of the tissues. In the other animal the ulcerations gradually increased, and numerous gray nodules appeared in their circumference and soon underwent purulent dissolution. These ulcerations were covered by a yellowish scab from beneath which a purulent fluid could be pressed. Pustulous eruptions also appeared in different parts of the body, but they soon healed. The animal became emaciated, and a snuffling respiration, with a nasal secretion, was observed, leading to the conclusion that the animal was undoubtedly affected with glanders. Both animals were killed five weeks after inoculation. In the first a dough-like mass was found at the locus inoculationis, the lymph-glands in the vicinity of the ear were swollen, but no neoplasmata were to be seen in the vicinity of the cut surface. In the posterior lobe of the left lung, which was attached to the thorax, was a large tumefaction with a nodulated surface and caseous contents; the other parts of the lungs were free from any complications. The bronchial lymph-glands were swollen and hyperæmic. The encapsuled caseous center should not be considered as a product of glanders infections, as such conditions are a frequent occurrence in rabbits, but they have been recorded as a participating phenomena in glanders.

In the second animal, besides the already described changes in the ear, the lymph-glands on the head, neck and axilla were enlarged, but free from noduli. In the lungs a few isolated gray noduli could be seen. The spleen was enlarged and of a reddish-brown color. The mucosa of the septum nasi of the right side presented a small ulceration with swollen edges and lardaceous base, underneath which a number of small noduli were about to conglomerate; the adjoining tissues were very hyperæmic.

In order to see if the injection of pure cultivations of glanders bacilli into the circulation of rabbits would produce a general infection of miliary noduli, as is the case in tuberculosis, a subcu-

taneous syringe-full of such material was injected into the aural vein of two rabbits. On the fourth day many gray noduli developed at the locus inoculationis. One animal was killed on the fifth day, to see if the local results were accompanied by similar complications in the internal organs, but they were unaffected. The second rabbit was found on the twelfth day in a very emaciated condition; besides noduli at the locus inoculationis, numerous submiliary neoplasmata were found in the spleen and liver. The parenchyma of the spleen was in a condition of cloudy swelling. No noduli were present in the pulmonary tissue; petechial hæmorrhages were dispersed throughout the pleuro-pulmonum. A small lenticular ulcer was found on the right side of the septum nasi, and a few submiliary noduli on the mucosa of the turbinal bones. Glanders bacilli were demonstrated in these neoplasms. The diagnosis of acute miliary glanders was thus confirmed. Dr. Loeffler did not experiment further with rabbits, as guinea-pigs were demonstrated to be a much more susceptible and practical animal for such purposes.

(*To be continued.*)

REPORTS OF CASES.

FRACTURE OF THE SKULL FROM THE KICK OF A MULE.

By Benj. McInnes, Jr., M.R.C.V.S.

(Paper presented to the United States Veterinary Medical Association.)

On February 28th, 1887, I was requested to go to the Clausen Brewing Company's stables to see a dead horse. On my arrival I found the proprietor, who related the history of the case as follows:

He found the horse restless in the stall, and having no work to do that day, his owner being away, he turned him into a small enclosure, in which there was also a mule. About fifteen minutes afterwards the stableman passed near the enclosure, and saw the horse suddenly drop on his haunches, lie over on his side, and die without a struggle.

I was sent for to determine the cause of death. I found him lying upon his left side, and there was no external sign by which I could discern the cause of death.

This occurred about 8 o'clock A. M. I made an autopsy at 3 P. M.

I severed the left fore leg from the trunk, and noticed that the blood was very dark and fluid; opened the chest, and found the lungs and heart in health; liver, kidneys and intestines healthy. I then removed the head from the neck, and dissected the skin back over the parietal and frontal bones. As soon as this was done, I noticed a large blood-clot over the right orbit, and, on removing the muscles, a fracture of the skull was revealed.

There was no abrasion of the skin over the seat of injury. A space of clotted blood, about two inches square, was found upon the brain. The fracture was evidently caused by the mule having kicked him.

OSTEO-SARCOMA.

By the Same.

The subject of this paper was the thoroughbred stallion Pacific, by Hunter's Lexington, dam by Capt. Beard. I mention this to show that, in so far as I know, there has been no cancerous diathesis in his family.

The notes on the case are as follows:

On January 15th, 1887, I was requested by Major T. G. Barker, who purchased Pacific from Mr. Chas. D. McCoy (both of Charleston, S. C.) on December 1st, 1886, to prescribe for said horse, who, he said, had a running from the nose, which was thought by Mr. McCoy, whom he had consulted, to be distemper. I was also to visit the horse at his home, at my earliest convenience. Having an engagement to go to Augusta, Ga., the following week, I was unable to see the horse until January 25th.

At this date I noticed the following symptoms: Slight catarrh from both nostrils; right side of face much enlarged, involving the nasal, superior maxillary and zygomatic bones. The eye was not affected in any way, nor was there any protrusion of the orbit. On opening the mouth to examine the teeth, a very

fœtid odor was detected, and slight hæmorrhage apparent. Breathing somewhat rough; condition and spirits good.

I thought that some disease of the molar teeth had caused the swelling, and recommended the owner to send the horse to my place in Charleston, where I could more carefully examine and watch the case.

The horse was brought to my stable on January 29th, 1887, and confined in a narrow stall during that night. Next morning his manger was covered with blood.

I then placed him in a large pen, to make him as comfortable as possible. His appetite was very good, and he masticated his oats without difficulty. The catarrh from the nostrils was thick and very offensive, and the hæmorrhage from his mouth profuse —in fact, exhaustive. When dressing the mouth every morning, large organized blood-clots would be washed out, and many would be found about his stable.

On opening the mouth with the speculum, nothing wrong could be seen about his teeth. When cast for this examination, and while the speculum was in his mouth, his breathing was impaired almost to suffocation.

A few days after this, I noticed two ulcerated spots upon the superior border of the tumor; these burst, and there issued therefrom thick pus, tinged with blood and very fœtid. These symptoms continued to become more aggravated.

After being here about a week, his appetite began to fail him, and it was with great difficulty that he could masticate his hay. He lost flesh, and seemed to be going down very fast. I told Major Barker that I thought it was a malignant tumor, known as osteo-sarcoma, but could not say positively as to its exact character until cut into.

I cast the horse on February 17th, 1887 (chloroform or ether, from the condition of the horse, being inadmissible), and with the assistance of Dr. J. J. Edwards, M.D., removed about three and three-quarter pounds of the tumor, which proved to be as diagnosed. The four last molars were involved in the tumor, and were picked out with our fingers. The tumor extended well into the nasal cavity, and as far back as the ethmoid bone. The

wound, after operating, was very large, extending through the buccinator muscle and exposing all the molar teeth of the right side. The lower lip was paralyzed, and deglutition completely suspended. He remained in this condition until February 23d, when he died.

The hæmorrhage during the operation was very great, although no very important vessel was cut except the submaxillary vein. I ligated the temporal artery before starting to operate, to assist in controlling hæmorrhage.

This paper is communicated to illustrate the rapidity of the growth of the tumor, and to get an expression of opinion as to where the responsibility lies.

AMERICAN VETERINARY HOSPITAL.

REPORTS OF CASES.

VESICAL CALCULUS—URETHROTOMY WITH COCAINE.

By Dr. J. Huelsen, Jr., D.V.S., House Surgeon.

The subject was a gray gelding, seven years old, which for some time had shown symptoms of frequent attempts at urination, or straining violently. These efforts were accompanied by slight colicky pains and a slight dropping of a few drops of urine from the sheath. The urine, collected in a graduate, was thick, and contained a large amount of mucous and a few striæ of blood. Rectal examination confirmed the suspicion of a stone in the bladder, the foreign body being detected movable, and about the size of a hen's egg.

The principal interest of this case rests on the great advantage that was derived from the use of cocaine as a local anæsthetic in the steps of the operation for the incision of the urethra.

Ten drops of four per cent. solution were injected above and below the ischial arch, and the operation performed in the standing position. The hind legs being hobbled, and a twitch placed on the animal's upper lip, an incision was made on the median

below the arch and kept until the urethra was entered, without the animal exhibiting the slightest pain. A pair of dog obstetric forceps being introduced into the bladder, the noise that it made in coming in contact with the stone rendered the diagnosis positive. An assistant then introduced his hand into the rectum, and, grasping the calculus, pushed it back between the jaws of the forceps, where, it being firmly held, it was with much traction removed, the animal showing scarcely any pain as the large body was extracted. The calculus, when fresh, weighed over six ounces, and measured 5½ inches on its small and 6 inches on its larger circumference. Its external surface was somewhat rough, and its structure analagous to those of a similar nature. The animal was discharged convalescent in a few days, the wound being left alone and cleanliness being the only after cares of the operation.

EMBOLISM OF THE ILIAC OF BOTH SIDES.

By H. B. Ambler, Student.

Through the kindness of Dr. G. Bridges, this patient was sent to the hospital for the benefit of the students and for post mortem examination.

Admitted on the 18th of March. The animal was a roan mare, about nineteen years old, which for the last six months had shown peculiar lameness. Whenever driven for about half a mile she would get lame, perspire profusely, her respiration became hurried, her pulse very weak, and then she would lie down in great pain. She had been treated for colics and for azoturia, but as she would recover from these attacks so quickly—viz., as soon as she had thoroughly cooled off—these diagnoses were considered as incorrect.

As the history of her case led to suspicion of embolism of the iliac arteries, a rectal examination was made when she was cold, and a weak pulsation detected on both sides. She showed cramps, however, on the right side.

On the 24th of March she was taken out of the stable and exercised. She had gone but a short distance when the cramps

of the off hind leg seemed to pass off, and for a little time she moved quite freely. After about 15 minutes' exercise she was taken lame on the near hind leg, and a little later on showed manifestations of great pain in both hind extremities. After half an hour's exercise her pains were such that she wanted to stop, and did so in spite of all efforts, which were quite freely used.

Brought into the stable and standing still, her pulse was found beating rapidly, her respiration was short and quick, her temperature slightly increased. She sweated profusely, and her legs alternately raised in a spasmodic, lancinating manner, both of them showing a marked lower temperature below the hock. Examined again by rectum, but very weak pulsation could be felt on the tract of the left iliac artery. The diagnosis being made, the animal was destroyed and a post-mortem made under the supervision of Dr. Bridges. It was then found that the posterior aorta, near her quadrification, was partly closed by a large clot of blood which extended into the left iliac, and could be traced down in the femoral as far as the femoro-popliteal artery. On the right side a clot existed also, but smaller, and not extending as low down as in the left artery.

COMMENCEMENT EXERCISES.

MONTREAL VETERINARY COLLEGE.

The Montreal Veterinary College and the Council of Agriculture celebrated the closing of the season for 1887, at which there was a large attendance of the pupils and their friends.

Mr. Blackwood, chairman of the agricultural committee of the Council of Arts and Agriculture, presided. There were also present Prof. McEachran, Dr. Lecreo, secretary Council of Agriculture; Mr. Casgrain, Dr. Bryden, of Boston, and Dr. Gadsden, of Philadelphia.

THE REPORT.

The following students registered during the past session: W. J. Torrance, Ottawa; A. S. Lamb, Montreal; Thos. E. Feron,

Montreal; Wm. Walsh, Huntington; E. W. Wieland, Buffalo; John A. Miller, Stony Lake, Ia.; D. J. Mullin, Montreal; Frank A. Miller, Granby, P. Q.; G. C. Becket, Montreal; John H. Roberts, West Shefford, P. Q.; E. L. Bateman, Tilston, Eng.; H. D. Smith, Montreal; W. B. Abbe, New Bedford, Mass.; H. McWhinnie, Ormstown, P. Q.; Jas W. Harwood, Bloomington, Ill.; R. H. Macfarlane, Montreal; R. A. Vannest, Minneapolis, Minn.; F. C. Vancor, Knowlton, P. Q.; A. M. York, Detroit, Mich.; J. Henderson, Prince Edward Island; J. D. Murphy, Montreal; J. F. Pease, Quincy, Ill.; M. E. Chapin, Springfield, Mass.; F. W. Skaife, Montreal; George S. Baker, Dunham, P. Q.; G. P. Dillon, Montreal; John McCurdy, Ormstown, P. Q.; Mark A. Dawes, St. Annes, P. Q; Robt. Austen, Dunham, P. Q.; W. E. McGarth, Allans Corners, P. Q.; J. H. Goddard, Adamsville, P. Q.; A. R. Rowat, Manotick, Ont.; R. Darling, Montreal; J. Meldrum, Montreal; J. G. Harris, Moosimin, N. W. T.; J. M. Parker, Massawippi, P.Q.; M. W. Simpson, Fulton, Mo.; C. R. Simpson, Columbia, Mo.; J. Robertson, Howick, P.Q.; H. R. Macaulay, Broadway, N.W. T.; M. Munro, Lancaster, Ont.; Jas. B. Paige, Prescot, Mass.; M. L. Miner, Abercorn, P.Q.; F. T. Metcalf, Buffalo, N. Y.; W. H. Craig, Dominionville, Ont.

EXAMINATIONS.

The students passed examinations in order of merit as follows:—

Botany (D. P. Penhallow, M. A. professor)—Darling, Harris, Chapin, Vannest, Bateman, Austin, McWhinnie, Wieland, York, Simpson, Parker, Dillon, Harwood, Henderson, Mullins, Meldrum, Goddard and McCurdy.

Histology (Geo. Wilkins, M.D., professor)—Pease, Macaulay, Harwood, Baterman, York, Miller, J. McCurdy, McWhinnie, Paige, Vannest, Wieland, Austin, Darling, Chapin, Harris, M. Simpson, Skaife, Munro, Goddard and Henderson.

Chemistry (G. P. Girdwood, M.D., professor)—Pease, Miller, J. Dawes, Macaulay, Feron, Paige, Robertson, Munro, McGarth.

Physiology (T. Westley Mills, M.D. professor)—Torrance,

McGarth, Becket, Paige, Robertson, Roberts, J. Miller, Vannest, Baker, Smith, Munro and Dawes.

Materia Medica (James Stewart, M.D., professor)—Paige, Munro, Becket, Pease, McGarth, Smith, Vannest, Macaulay, Dawes, Meldrum, Roberts, Robertson.

Cattle Pathology (Charles McEachran, V.S., professor)—Torrance, Rowat, F. Miller, C. R. Simpson, Feron, Murphy, Baker and Craig.

Anatomy (Mr. C. Baker, V.S., professor)—Torrance, Rowat, F. Miller, Feron, Murphy and C. R. Simpson, equal, and Baker.

General Pathology, Practice of Veterinary Medicine and Surgery (D. McEachran, F.R.C.V.S., professor)—Torrance, Rowat, Feron, F. Miller, C. R. Simpson, Baker and Metcalf.

Final oral examination by the board of examiners appointed by the Council of Agriculture, consisting of Messrs. J. W. Gadsden, M.R.C.V.S., of Philadelphia; Williamson Bryden, V.S., Boston; J. A. Couture, V.S., Quebec; Arch. McCormick, V.S., Ormstown, Que.; A. W. Harris, V.S., Ottawa; Geo. Leclerc, M.D. The following students passed: Messrs. Torrance, Rowat, F. Miller, Feron, C. R. Simpson, and Baker.

The diplomas and prizes were distributed by Dr. Leclerc. The following gentlemen having attended the prescribed three sessions and passed the written and oral examinations in botany, physics, histology, chemistry, physiology, materia medica, anatomy, cattle pathology, general pathology and practice of veterinary medicine and surgery, received the diploma, viz.: Messrs. Torrance, Rowat, F. Miller, Feron, Simpson and Baker.

The following is the prize list:

SENIOR CLASS.

For the best general examination in all subjects, a silver medal, the gift of the Council of Agriculture, won by W. J. Torrance.

Practice of Veterinary Medicine and Surgery—1st, W. J. Torrance; 2nd, A. R. Rowat.

Cattle Pathology—W. J. Torrance.

Anatomy—W. J. Torrance.

SECOND YEAR.

Practice of Veterinary Medicine and Surgery—1st, H. R. Macaulay; 2nd, John Miller.

Cattle Pathology—Jas. B. Paige and H. R. Macaulay, equal.

Anatomy—J. F. Pease.

Materia Medica—1st, Jas. B. Paige; 2nd, M. Munro.

THE ONTARIO VETERINARY COLLEGE.

The closing exercises of the Ontario Veterinary College were held at Toronto, on March 31, in the spacious lecture-room of the college in Temperance Hall, which was crowded to the doors with students and visitors. Among those present were Lieut.-Governor Robinson, President Wilson, of the University of Toronto, Mayor Howland, and other distinguished personages. The Lieut.-Governor and several others present assisted in the distribution of prizes, the exercises being presided over by Mr. Andrew Smith, V.S., President of the college.

THE GRADUATES.

The following is a list of those successful in the examinations:

Alexander, C. F., Hoosac, N. Y.
Austin, E., Simcoe, Ont.
Barnes, A. S., Fingal, Ont.
Beardsley, C. D., Union Springs, N. Y.
Beatty. —
Black, J. B., Brampton, Ont.
Blackwell, J. E., London, Ont.
Booker, J. C., Jerseyville, Ill.
Bowler, J., Amherstburg, Ont.
Brady, L. R., Manhattan, Kan.
Brown, J. E., Wilmington, O.
Buskirk, J. D., Bradley, Mich.
Carter, O. J., Toledo, O.
Carmichael, W., Seaforth, Ont.
Chamberlain, H. D., Waterloo, Ind.
Chase, C. G., Consecon, Ont.
Coffin, E., Monticello, Ill.
Cook, J. W., Clinton, Ont.
Coseford, S. E., Hollin, Ont.
Clarke, J. G., Little Britain, Ont.
Clark, W. F., Goderich, Ont.
Craig, R. L., Hamilton, Ont.
Creamer, J., Belmont, Ont.
Crosby, M. H., Uxbridge, Ont.
Culp, J. J., Orangeville, Ont.
Curphey, J. M., Rochester, Ind.;
Davidson, H. H., Burlington, Ont.
Dodds, W. G. K., Toronto.
DuBois, G. B., Nicholson, Pa.
Dyer, W. O., Belmont.
Evans, J. S., Chelsey, Ont.
Fee, H. A., Tiverton, Ont.
Fitzgerald, G. J., Lucan, Ont.
Fletcher, B., Oxford Mills, Ont.
Foos, A. C., Reading, Pa.
Fry, H. W., Dunnville, Ont.
Gardenier, W. J., Quincy, Ill.
Grime, J. R., Blackpool, Eng.
Gibson, J. I., Kemptville, Ont.
Giffin, W. A., Mayfield, Ont.
Gillin, J. R., Belleville, Ont.
Good, C. R., Williamsport, Pa.

Grainger, M. R., Thamesville, Ont.
Goulding, J. H., Greenville, Mich.
Harris, J. G., Ashburn, Ont.
Harston, C. S., Westminster, Md.
Henderson, D., London, Ont.
Hinebauch, T. D., Vicksburg, Mich.
Hoffman, N., Buffalo, N. Y.
Holland, R. G., Wellington, O.
Hollister, F. B., Montrose, Pa.
Hollingsworth, C. E., Hillsborough, O.
Hopkins, W. H., Green River, Ont.
Howes, B., Carleton Station, N. Y.
Hutchins, A., Stratford, Ont.
Hunter, S. L., Bath, N. Y.
Hunt, F., Jamestown, N. Y.
Jeffrey, F. M., Wis.
King, D., Toronto.
King, J., Dresden, Ont.
King, T. A., Brampton, Ont.
Kiteley, B. W., Sharon, Ont.
Klicker, H. C., Clarence, N. Y.
Kline, J. J., Allentown, Pa.
Lavery, J. F., Uxbridge, Ont.
McDermott, T. W., Le Roy, O.
McFadden, A., Dunlain, Ont.
McKenzie, A., Port Perry, Ont.
McLean, L , Alliston, Ont.
McMillan, J. L., Vernon River, P. E. I.
Murtry, J. C., SouthMarch, Ont.
McTaggart, A., Nassageways, Ont.
McClintock, J., Galva, Ill.
McVicar, J. D., Poplar Hill, Ont.
Morgan, G. E., Chicago, Ill.
Moore, J., Plainfield, Ont.
Notman, C. R., Toronto.
Nicholls, W., Uxbridge, Ont.
Nichols, S., Cobourg, Ont.
Nugent, O. F., London, Ont.
Orr, S. C., Riley Centre, Kan.
Orr, L. F., Canaan, O.
Prusham, J. P., London, Ont.
Purvis, T., Mallorytown, Ont.
Reycraft, R., E. Murkirk, Ont.
Richards, W. H., Greenville, O.
Richards, H. S., Wooster, O.
Rodgers, J. C., Ayr, Ont.
Rudd, S. C., Guelph, Ont.
Rutherford, J. D., Lucknow, Ont.
Shields, A. W., Malton, Ont.
Sinclair, J. A., Uxbridge, Ont.
Sloan, J. M., Vicksomburgh, Pa.
Steen, J., Harwich, Ont.
Snider, S. S., Lawrenceville, O.
Snyder, O. W., Lynville, Pa.
Sullivan, J., Almont, Ont.
Summerfeldt, G. H., Toronto.
Sutterby, F., Batavia, N. Y.
Taylor, J. Q., Marysville, O.
Tye, F. M., Haysville, Ont.
Vsitch, J. H., Waterloo, Ont.
Waldron, R. M., Greensburg, Pa.
Wallace, W. B., Middletown, O.
Ward, H. H., Rochester, Ind.
Waring, J., Thornbury, Ont.
Waters, J. W., Fingal, Ont.
Weese, W. F., Plattsville, Ill.
Welsh, J., Manchester, Ont.
Wilkinson, F. C., Claremont, N. H.
Winner, C. E., Muncy, Pa.
Wiltrout, F. A., Litzenburg, Pa.
Watson, T. W., Marshalltown, Iowa.
Walton, T. W. Warren, Ill.
Young, W. C., Bristol Corners, P. Q.

MEDALISTS AND PRIZE WINNERS.

The gold medal for the best general examination, presented by the Ontario Veterinary Medical Association, was awarded to John E. Blackwell, of London, Ont.

Pathology—Seniors: Silver medal, J. C. Booker; 2d prize, R. M. Waldron; 3d, J. E. Blackwell and C. E. Winner. Juniors: 1st, R. L. Jameson; 2d, C. D. Morris; 3d, W. H. Lindsay, J. D. McGregor, W. T. Russell and W. H. Allis (equal.)

Anatomy—Seniors: Silver medal, J. E. Blackwell; 2d, R. M. Waldron; 3d, H. Fell. Juniors: Silver medal, W. E. Russell; 2d, W. Burger; 3d, E. D. McQueen and S. J. Robinson (equal.)

Physiology—Seniors: Silver medal, J. Rutherford; 2d, J. E. Blackwell; 3d, H. Fell. Juniors: 1st, J. J. Coutts; 2d, A. G. Wicks.

Chemistry—Seniors: 1st, J. Moore; 2d, T. D. Hinebauch; 3d, J. G. Harris. Juniors: T. H. Smythe.

Materia Medica—Seniors: 1st, J. E. Blackwell; 2d, E. Coffin; 3d, J. J. Kline and R. M. Waldron (equal.)

Microscopy—Seniors: 1st prize, C. E. Winner, H. Fry, J. Rutherford (equal).

Bacteriology—Seniors: 1st, B. Johnstone and C. E. Winner (equal.)

Entozoa—Seniors: 1st, F. N. Lijer.

LIST OF GRADUATES.*

HARVARD UNIVERSITY—VETERINARY DEPARTMENT.

Edward Campbell Beckett.....50 Village St., Boston.
Alfred Mahlon Bigelow.....Cor. Washington and Cottage Sts., Norwood.
Charles Saunders Breed.....441 Tremont St., Boston.
Daniel David Lee.....Storey Place, Jamaica Plain.
William Esrom Peterson.....Cor. Main and Church Sts., Waltham.
Herbert Massey Smith.....30 Essex St., Haverhill.
William Herbert Way.....22 Elm St., Chelsea.
Kenelm Winslow.....Perkins St., Jamaica Plain.

* From the Fifth Annual Announcement, 1887-'88.

CORRESPONDENCE.

ON HOG CHOLERA ETIOLOGY.

LINCOLN, NEB., March 28, 1887.

Editor American Veterinary Review:

I see by your March number that Dr. Salmon still insists that there are "two distinct swine plagues" in this country. Now I will not say there are not, but I will say, and leave it to the future to decide the correctness of my assertion, that no one has

yet described "two distinct swine plagues" in this country. Unfortunately, you do not give the date of Dr. Salmon's communication, so I cannot tell whether it was written before or after my individual communication upon the "Etiological Moment in American Swine Plagues," which was issued December last, and of which a copy was sent to Dr. Salmon. In that paper my position was positively stated and I still adhere to it. I there endeavored to show why so many ideas had been promulgated about this disease where authors had endeavored to characterize it by its pathological lesions. And I also endeavored to show that no one of these lesions, except those of the lymph gland, could be called pathognomonic. It is no wonder that Dr. Salmon is trying to explain his unexplainable inconsistencies, and, as far as I can judge from his descriptions, I still claim that the Nebraska disease is identical with that described by him in 1885, and that there is some mistake about his description of the germ.

As you know my paper on the "Etiological Moment in Swine Plague," will you please publish it in justice to me, as well as to show my real position towards the paper on Hueppe's communication published in your issue of March, 1887. If Dr. Salmon's letter to you was written subsequent to my publication of December last, he simply shows his intellectual dishonesty and inconsistent character when he says I have "not yet told us whether the germ is motile or non-motile," as in that paper I distinctly said *it was*, "all authorities to the contrary." The latter remark was directed at Schuetz of Berlin, as, if his germ is "non-motile" in fluid culture, it is the only essential point of biological differentiation between our micro-organisms. I am sincerely obliged to Dr. Salmon for calling my attention to the mistake made by Dr. Bowhill with regard to "ech. gigas," calling it "ascaris suilla." I did not give the parasite (as such) even a moment's thought at the time, nor have I since, my whole attention being called to the great similarity of the lesions it caused in the small intestine to those often seen in swine plague in the large, *but not necessary to it.* Dr. Bowhill took down Cobbold and wrote the description from him. I did not even look at it or the worm, being very busy on other matters. I make

no other apologies. It was simply want of thought from too much pressure from other work. To-day I examined the object and see it has a pointed tail and a horned proboscis, so I stand corrected. I am not hunting worms at present. The time will surely come when either Salmon or I will have to take a back seat on this swine plague question, but while I admit there may be another disease with a different micro-organism than that yet seen by me, *I must positively assert that no one has described it yet, and that my views as published by myself have not been contradicted successfully by anyone.* I have had no two germs so far, and I do find intestinal lesions in many hogs, that die or are personally killed, before death. I do not consider them essential to swine plague, but an accidental complication, as is also the pneumonia, which is more frequent than the intestinal lesions. Detmers found the same conditions and came to the same conclusions.

In time this question will be settled, and the world will know who is right, honest, and consistent between Dr. Salmon and myself. Most respectfully yours,

FRANK S. BILLINGS.

VETERINARIAN WANTED.

HACKETTSTWON, N. J., March 18th, 1887.

DEAR SIR:—This town and vicinity is greatly in need of a regular veterinary surgeon.

The present Legislature has just passed (15th inst.) a bill requiring veterinary surgeons to be graduates of a regular college. Penalty for violating said act is $25.00 fine or six months imprisonment. Exemption is granted to persons with ten years' experience of the veterinary practice and who have *practiced that length of time in the same locality.* There is not a regular veterinary surgeon within twenty miles. This is a splendid country, and to an alive man, and one who has *had practice* and not too young, a good practice is guaranteed. There is no opposition; that is, can't be with the present law, by those who have been practicing here.

Population of Hackettstown, 3,000.

Will answer any questions cheerfully.

Yours very truly, WM. F. SHIELDS.

ON GLANDERS.

DAYTON, OHIO, April 11, 1887.

Editor American Veterinary Review:

DEAR SIR.—In an article on "Glanders," which appeared in your April number, reference is made to Professor Williams and Dr. Fleming's theory on the origin and generation of *glanders*, in which the writer says the above gentlemen "speak of glanders as a special diathesis peculiar to the equine species." Now if the writer kept himself posted in regards to the above gentlemen's opinion on this subject, he would know that both Professor Williams and Dr. Fleming have long since changed their opinion as to the origin and generation of *glanders*. They both claim "*glanders*" is due to contagion only, and this contagion is in the form of a special micro-organism, and an animal can only contract the disease by inoculation either by an abrasion of the skin or wound of the mucous membrane.

Yours respectfully, WALTER SHAW, V.S.

ON VETERINARY REGISTRATION.

Editor of American Veterinary Review:

SIR:—The accompanying communication seems to me to be a very good illustration of the qualifications of the best samples of those who would take advantage of the registration laws as existing, and would parade themselves as registered veterinarians, etc., men of some standing, as it were, in many communities, but to my mind the parasites that destroy the legitimate growth of our profession, and which show that sometimes a little knowledge is worse than none at all. W. H. L.

DEAR DOCTOR:—I found this morning a diseased cow which I had destroyed, fearing she would create disease among the other cattle. When I came to kill her I found the lungs, or a portion of them, filled with tuberculosis buds just ready to mature and set the fire agoing. This cow had not been kept with the other cattle, but I think it prudent to have the other three inoculated. Will you be kind enough to send me or instruct me where I can obtain virus to inoculate them with, and oblige,

Yours truly, G. W. M.